

## 8.2 RESULTS OF UNCERTAINTY ANALYSIS

The certainty of model output variable can be represented by the half-width of the 90 percent certainty band. The terms certainty bands and uncertainty bands are used interchangeably in the discussion. The general rule is the narrower the bands, the greater the level of certainty. Tables 8.2.1 through 8.2.6 contain results for the first-order approximation uncertainty analysis.

Table 8.2.1 lists the uncertainty bands associated with gages located within LECSA1 and North Service Area. The half-width of the uncertainty bands (or simply, **half-width**) for these two areas are between 0.07 feet and 1.21 feet with an average of about 0.43 feet. Stages simulated at the West Palm Beach Catchment Area have the highest uncertainty within these two areas. Water levels measured at monitoring points near a canal, e.g., gage at WPBCFS which is near the C-51 canal or LOXR1 which is close to Loxahatchee River, tend to have higher certainty. Some general statements can be made for Tables 8.2.2 through 8.2.6 related to uncertainty bands and relative contributions of parameter uncertainties to model output uncertainties pertinent to other geographical regions covered by the model (Trimble, 1995a):

1. The average value of the half-width for all gages in LECSA2 is about 0.43 feet. All parameter values with half-widths greater than one foot tend to show a strong contribution from the groundwater hydraulic conductivity parameter. Wetland PET and seepage play relatively minor roles in the uncertainty of simulated stages in LECSA2.
2. As contrasted with the other LECSAs, LECSA3 shows greater contribution from wetland PET and seepage parameters. The mean half-width for all gages in this service area is about 0.29 feet.
3. Wetland PET, groundwater hydraulic conductivity, and canal-groundwater hydraulic conductivity dominate the list of parameters contributing to uncertainties associated with simulated stages in the Water Conservation Areas. The mean half-width for all gages in this "natural" area is about 0.37 feet.
4. Everglades National Park, relative to other regions in the system, shows the most significant contribution from the surface roughness coefficient. All other parameters with the exception of the canal-groundwater hydraulic conductivity and detention depth make significant contributions to the uncertainty of simulated stages in this area. Two-tenths of a foot is about the average half-width for the park.
5. For coastal outflows, coastal PET dominates the list of parameters contributing to uncertainties associated with this model output.

**Table 8.2.1** Half-Width of 90% Uncertainty Band and Contributions by Parameters for Lower East Coast Service Area 1

GAGES Feet	BAND ---Percentage Contribution---	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
PB732	0.40	0.	1.	17.	64.	0.	0.	18.
PB88	0.52	0.	3.	4.	89.	0.	0.	4.
PB99	0.66	0.	20.	15.	59.	0.	0.	6.
PB809	0.41	0.	0.	23.	54.	0.	0.	23.
PB445	0.26	0.	23.	0.	13.	0.	0.	63.
PB1491	0.47	0.	14.	21.	45.	0.	0.	20.
PB1660	0.42	0.	40.	28.	8.	0.	0.	24.
PB1661	0.42	0.	40.	28.	8.	0.	0.	24.
PB1495	0.41	0.	16.	4.	52.	0.	0.	28.
PB1494	0.42	0.	40.	28.	8.	0.	0.	24.
PB900	0.33	0.	38.	10.	10.	0.	0.	42.
PB683	0.35	1.	18.	5.	3.	0.	0.	73.
PB1515	0.29	0.	52.	2.	2.	0.	0.	43.
PB1639	0.52	0.	3.	4.	89.	0.	0.	4.
WPBCFS	0.10	0.	0.	3.	36.	0.	0.	61.
PB561	0.49	1.	1.	12.	5.	0.	6.	75.
PB109	0.07	16.	1.	0.	0.	1.	56.	26.
PB831	0.19	40.	0.	0.	0.	0.	60.	0.
PB565	0.89	0.	0.	25.	69.	0.	0.	6.
LOXR1	0.15	0.	1.	33.	0.	0.	0.	65.
SCUMW	0.31	0.	2.	8.	0.	0.	10.	79.
JUP.W	0.53	0.	21.	4.	4.	0.	0.	70.
WPBCA	1.21	1.	5.	3.	0.	42.	0.	49.

1 Wetland Potential Evapotranspiration - PET

2 Groundwater Hydraulic Conductivity - GWHC

3 Canal-Groundwater Hydraulic Conductivity - CHHC

4 Detention Parameter - DET

5 Seepage Parameter - SP

6 Surface Roughness Coefficient - SRC

7 Coastal Evapotranspiration - CET

**Table 8.2.2** Half-Width of 90% Parameter Uncertainty Band and Contributions by Parameters for Lower East Coast Service Area 2

GAGES Feet	BAND -----	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
	Percentage Contribution							
F291	0.15	1.	0.	10.	51.	1.	1.	37.
G1222	0.19	7.	0.	7.	0.	2.	0.	83.
G617	0.19	3.	21.	13.	12.	1.	0.	50.
G561	0.22	0.	0.	36.	42.	0.	0.	20.
G820A	0.38	0.	0.	3.	31.	0.	8.	57.
G853	0.73	0.	28.	14.	18.	0.	7.	33.
G1225	0.22	1.	3.	1.	29.	0.	0.	65.
G2032	0.28	1.	20.	42.	14.	0.	0.	23.
G2033	0.32	1.	1.	2.	44.	0.	0.	52.
G2031	0.18	1.	42.	11.	13.	1.	0.	32.
G616	0.27	0.	10.	6.	49.	0.	0.	35.
G2030	0.48	0.	38.	42.	3.	0.	0.	16.
G1213	0.41	0.	57.	20.	3.	0.	0.	19.
G1260	1.48	0.	50.	1.	11.	0.	20.	18.
G1472	0.15	1.	0.	10.	51.	1.	1.	37.
G1473	0.15	1.	0.	10.	51.	1.	1.	37.
G1636	0.15	2.	45.	40.	1.	3.	0.	9.
G2035	0.30	0.	20.	32.	20.	0.	0.	27.
G1226	0.30	0.	20.	32.	20.	0.	0.	27.
G1224	0.14	2.	1.	5.	51.	1.	2.	38.
G1223	0.16	1.	15.	40.	12.	1.	0.	30.
G1322	0.16	14.	7.	0.	6.	13.	1.	59.
G2034	0.19	7.	0.	7.	0.	2.	0.	83.
G2376	0.19	21.	19.	57.	0.	2.	0.	0.
2B-Y	0.22	2.	12.	29.	24.	0.	0.	33.
G1221	0.09	1.	3.	6.	31.	1.	2.	57.
S329	0.50	0.	17.	1.	27.	0.	3.	53.
G2395	1.08	0.	62.	15.	9.	0.	0.	13.
G1220	0.20	0.	5.	33.	43.	0.	0.	19.
G2275	0.38	0.	0.	3.	31.	0.	8.	57.
G2444	1.08	0.	62.	15.	9.	0.	0.	13.
G2443	0.47	0.	2.	48.	18.	1.	0.	31.
G1262	1.08	0.	62.	15.	9.	0.	0.	13.
G1316	0.48	0.	6.	9.	19.	0.	4.	62.
G2147	0.47	0.	0.	11.	38.	0.	8.	42.
G2148	0.73	0.	28.	14.	18.	0.	7.	33.
G1215	1.46	0.	55.	4.	5.	0.	16.	20.
G1315	0.84	0.	23.	35.	10.	0.	3.	29.
G864	0.24	4.	5.	0.	0.	2.	1.	88.

note: Parameter abbreviations are the same as in Table 8.2.1.

**Table 8.2.3** Half-Width of 90% Parameter Uncertainty Band and Contributions by Parameters for Lower East Coast Service Area 3

GAGES Feet	BAND	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
		Percentage Contribution						
G613	0.26	9.	4.	2.	2.	11.	0.	72.
G1183	0.16	2.	1.	0.	4.	0.	0.	92.
G596	0.38	10.	8.	1.	4.	56.	0.	19.
F319	0.18	1.	9.	4.	12.	12.	0.	61.
F179	0.16	1.	18.	8.	9.	11.	0.	53.
G852	0.16	0.	0.	0.	35.	0.	0.	65.
F358	0.21	2.	0.	0.	2.	0.	3.	92.
S196A	0.19	4.	6.	1.	2.	1.	0.	86.
G1363	0.18	6.	18.	0.	2.	0.	0.	74.
G614	0.23	2.	7.	0.	5.	0.	0.	86.
G757A	0.17	6.	5.	1.	2.	0.	0.	85.
S182	0.15	0.	1.	0.	12.	0.	0.	87.
G855	0.20	3.	1.	0.	5.	0.	0.	90.
G799	0.51	0.	32.	48.	5.	2.	0.	12.
G1488	0.25	41.	57.	0.	0.	0.	0.	2.
G976	0.25	15.	58.	4.	0.	0.	0.	22.
G3253	1.36	0.	98.	0.	0.	0.	0.	1.
G975	0.38	37.	33.	4.	1.	9.	1.	14.
G972	0.36	1.	2.	8.	9.	39.	19.	22.
G973	0.08	3.	0.	7.	2.	9.	0.	78.
G3259A	1.36	0.	98.	0.	0.	0.	0.	1.
G3329	0.20	2.	0.	0.	40.	7.	0.	51.
G3327	0.11	1.	0.	2.	26.	11.	0.	59.
F45	0.12	0.	3.	0.	39.	2.	7.	49.
F239	0.14	0.	5.	3.	35.	2.	0.	55.
G1637	0.15	9.	19.	62.	0.	3.	0.	6.
G1251	0.11	29.	8.	0.	0.	0.	40.	23.
G3259A	1.36	0.	98.	0.	0.	0.	0.	1.
G3329	0.20	2.	0.	0.	40.	7.	0.	51.
G3327	0.11	1.	0.	2.	26.	11.	0.	59.
F45	0.12	0.	3.	0.	39.	2.	7.	49.
F239	0.14	0.	5.	3.	35.	2.	0.	55.
G1637	0.15	9.	19.	62.	0.	3.	0.	6.
G1251	0.11	29.	8.	0.	0.	0.	40.	23.

note: Parameter abbreviations are the same as in Table 8.2.1.

**Table 8.2.3 (cont.)** Half-Width of 90% Parameter Uncertainty Band and Contributions by Parameters for Lower East Coast Service Area 3

GAGES Feet	BAND	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
		---Percentage Contribution---						
G1486	0.18	2.	0.	7.	4.	0.	0.	86.
G1362	0.24	1.	12.	0.	4.	0.	0.	82.
G860	0.24	0.	17.	21.	5.	1.	0.	56.
G553	0.33	0.	2.	19.	19.	1.	0.	59.
G580	0.25	0.	9.	21.	11.	2.	0.	56.
G858	0.25	1.	1.	1.	22.	0.	0.	76.
G3073	0.64	0.	32.	56.	3.	2.	0.	7.
G3074	0.64	0.	32.	56.	3.	2.	0.	7.
G551	0.51	0.	32.	48.	5.	2.	0.	12.
G1074B	0.64	0.	32.	56.	3.	2.	0.	7.
G3439	0.15	7.	5.	9.	3.	0.	0.	76.
G3328	0.11	1.	0.	2.	26.	11.	0.	59.
S19	0.10	2.	1.	7.	29.	11.	0.	51.
G974	0.33	3.	84.	0.	0.	0.	0.	13.
G968	0.41	35.	15.	1.	2.	30.	0.	16.
G3264A	0.33	2.	72.	4.	0.	0.	0.	21.
G3	0.15	1.	2.	4.	34.	4.	0.	55.
G1368A	0.10	2.	1.	7.	29.	11.	0.	51.
S68	0.10	2.	1.	7.	29.	11.	0.	51.
G1166	0.09	0.	25.	26.	2.	2.	0.	45.
G970	0.15	2.	45.	40.	1.	3.	0.	9.
S18	0.23	0.	1.	1.	35.	0.	0.	63.
G1487	0.14	10.	5.	3.	0.	5.	1.	76.
G789	0.18	9.	3.	3.	0.	3.	0.	81.

note: Parameter abbreviations are the same as in Table 8.2.1.

**Table 8.2.4** Half-Width of 90% Parameter Uncertainty Band and Contributions by Parameters for Water Conservation Areas

GAGES	BAND	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
Feet		-----Percentage Contribution-----						
1-7	0.15	72.	22.	0.	0.	2.	1.	3.
1-8T	0.26	51.	42.	1.	0.	2.	0.	4.
1-8C	0.26	51.	42.	1.	0.	2.	0.	4.
1-9	0.19	58.	35.	0.	0.	3.	1.	3.
2A-17	0.15	46.	22.	1.	0.	16.	15.	0.
2A-300	0.18	43.	35.	1.	0.	14.	7.	0.
2A-159	0.12	27.	3.	0.	0.	2.	68.	0.
2B-21	0.63	14.	37.	1.	0.	38.	1.	8.
3A-NW	0.25	57.	29.	0.	0.	8.	5.	0.
3A-10	0.46	49.	37.	0.	0.	14.	0.	0.
3A-NE	0.39	59.	27.	0.	0.	14.	0.	0.
3A-2	0.17	50.	23.	0.	0.	10.	17.	0.
3A-3	0.58	46.	36.	0.	0.	17.	1.	0.
3A-9	0.57	48.	36.	0.	0.	16.	0.	0.
3A-4	0.50	47.	36.	0.	0.	16.	1.	0.
3A-28	0.58	45.	37.	0.	0.	17.	1.	0.
C-54	0.16	79.	2.	0.	1.	0.	18.	0.
3A-11	0.35	59.	28.	0.	0.	12.	0.	0.
3A-S	0.34	50.	34.	0.	0.	15.	1.	0.
L28	0.31	71.	14.	3.	0.	12.	0.	0.
3A-SW	0.28	62.	21.	3.	0.	14.	0.	0.
3B-2	0.22	46.	22.	3.	2.	14.	3.	11.
3B-29	0.84	21.	13.	5.	4.	32.	4.	22.
3B-SE	0.64	23.	16.	2.	3.	37.	3.	17.
C-296	0.54	1.	8.	90.	0.	0.	1.	0.
C-495	0.34	3.	8.	86.	0.	0.	3.	0.
3A-12	0.55	47.	37.	0.	0.	16.	0.	0.

note: Parameter abbreviations are the same as in Table 8.2.1.

**Table 8.2.5** Half-Width of 90% Parameter Uncertainty Band and Contributions by Parameters

## for Everglades National Park

GAGES	BAND Feet	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
-----Percentage Contribution-----								
NP201	0.14	1.	0.	1.	1.	2.	91.	3.
NESRS1	0.25	24.	12.	4.	4.	36.	2.	17.
NESRS2	0.38	22.	13.	2.	3.	43.	0.	16.
NESRSS3	0.65	10.	11.	2.	2.	67.	1.	7.
G618	0.36	24.	5.	8.	4.	42.	0.	18.
G620	0.16	3.	2.	1.	2.	3.	84.	6.
G1502	0.40	21.	29.	1.	3.	30.	0.	16.
NP33	0.15	4.	1.	0.	0.	0.	94.	1.
NP206	0.21	20.	16.	0.	0.	5.	58.	1.
NP36	0.09	29.	4.	0.	0.	0.	65.	2.
RUTZKE	0.21	14.	26.	5.	4.	35.	1.	16.
THSO	0.08	52.	7.	0.	6.	1.	16.	19.
FROGP	0.18	13.	13.	0.	0.	2.	1.	71.
NP207	0.10	46.	18.	0.	11.	0.	24.	0.
L67EXW	0.17	3.	0.	0.	0.	0.	95.	1.
L67EXE	0.17	3.	0.	0.	0.	0.	95.	1.
L67ES	0.15	13.	5.	0.	0.	6.	74.	1.
G3273	0.40	21.	29.	1.	3.	30.	0.	16.
NP202	0.17	1.	0.	0.	1.	1.	94.	3.
ANGEL	0.38	10.	8.	1.	4.	56.	0.	19.
NP_PH	0.13	0.	3.	4.	9.	30.	55.	0.
EVER1	0.12	29.	0.	4.	3.	13.	1.	50.
EVER2B	0.15	21.	1.	5.	1.	7.	4.	61.
EVER3	0.10	54.	28.	0.	3.	0.	14.	1.
EVER4	0.18	10.	1.	0.	0.	3.	6.	78.
G3353	0.12	18.	32.	1.	5.	4.	38.	2.
EPGW	0.13	0.	3.	4.	9.	30.	55.	0.
EP12R	0.30	15.	7.	5.	4.	17.	0.	53.
EP9R	0.12	0.	7.	3.	7.	24.	58.	0.

note: Parameter abbreviations are the same as in Table 8.2.1.

**Table 8.2.6** Half-Width of 90% Parameter Uncertainty Band and Contributions by Parameters for Canals

GAGES	BAND Feet	PET <sup>1</sup>	GWHC <sup>2</sup>	CHHC <sup>3</sup>	DET <sup>4</sup>	SP <sup>5</sup>	SRC <sup>6</sup>	CET <sup>7</sup>
		----Percentages Contribution---						
C-18	0.09	8.	0.	1.	0.	0.	2.	88.
C-51	0.05	0.	1.	0.	3.	0.	0.	95.
LWDSO	0.14	0.	0.	1.	30.	0.	0.	69.
LWDSE	0.14	0.	0.	0.	27.	0.	0.	72.
L-8	0.40	21.	0.	20.	0.	0.	1.	58.
HLSB	0.04	1.	3.	2.	2.	1.	0.	91.
C-14	0.13	1.	0.	1.	6.	13.	0.	80.
C-14E	0.13	0.	1.	0.	6.	13.	0.	79.
C-13	0.16	2.	2.	2.	13.	2.	0.	79.
C-12	0.28	0.	0.	2.	22.	0.	0.	75.
C-11W	0.15	22.	15.	3.	0.	23.	2.	35.
C-11	0.02	15.	19.	5.	0.	20.	2.	39.
NNRC	0.03	5.	5.	9.	3.	8.	0.	70.
C-9	0.04	14.	8.	2.	0.	4.	1.	71.
C-6	0.05	6.	5.	0.	3.	30.	0.	56.
C-4	0.14	6.	2.	4.	0.	53.	0.	35.
L31NC	0.06	9.	2.	3.	0.	22.	0.	64.
L-31	0.17	9.	9.	1.	0.	1.	0.	79.
C111	0.18	9.	9.	1.	0.	3.	0.	77.
C111E	0.31	12.	9.	6.	3.	18.	2.	50.
S197	0.74	12.	7.	7.	6.	26.	3.	39.
C-1P	0.16	1.	7.	1.	3.	0.	0.	88.
C102	0.17	4.	11.	0.	0.	0.	0.	84.
C103S	0.17	5.	9.	1.	0.	1.	0.	85.
S-179	0.13	2.	2.	1.	0.	0.	0.	94.
L-30	0.58	25.	24.	5.	3.	16.	3.	22.
CA-3	0.67	43.	38.	0.	0.	18.	1.	0.
L-29	0.43	22.	5.	8.	4.	42.	0.	20.
C-7	0.05	2.	7.	0.	4.	4.	0.	83.
C-8	0.11	0.	0.	1.	9.	0.	0.	89.
C-NO	0.12	5.	4.	0.	0.	0.	0.	90.
S-21	0.10	1.	8.	2.	0.	0.	0.	88.
C102N	0.12	5.	5.	0.	0.	1.	0.	89.
CA-1	0.43	47.	43.	1.	0.	3.	0.	5.
L-38	0.31	38.	31.	1.	0.	25.	2.	3.
CA-1	0.43	47.	43.	1.	0.	3.	0.	5.

note: Parameter abbreviations are the same as in Table 8.2.1.

The results of the uncertainty analysis using regression of the calibration output are discussed next. The deviation of the regression line from a line with a slope of unity is a measure of model bias. On the other hand, the scatter of data about the regression line is a measure of the uncertainty of the model algorithms themselves, the associated input data, and corresponding parameters. Tables 8.2.7 through 8.2.12 contain statistics related to the regression performed on the different regions and canals in the system. Some general statements can be made about these tables (Trimble, 1995a):

1. The average uncertainty band for LECSA1 (0.81 feet) is nearly double that of the uncertainty band presented using parameter uncertainty alone. For stations PB561 and WPBCA, the slope of the regression line is close to unity. This indicates that the model results for these two gages are unbiased. However, due to large uncertainty bands for both gages, large uncertainties still exist in the simulated stages -- possibly due to data uncertainties (Flavelle, 1992).
2. The average uncertainty band for LECSA2 is about 0.86 feet. Again, this is about twice as much as the bandwidth due to parameter uncertainty.
3. The half-widths for LECSA3 ranges from 0.3 to 1.7 feet with a mean value of about 0.75 feet.
4. The mean half-width for WCA is about 0.92 feet - more than two times the parameter uncertainty computed for the same area. This phenomena may be due to the fact that uncertainties associated with historical rainfall in the area account for a lot of uncertainties, considering that only a sparse network of rain gages exists in the WCAs. Again, parameter uncertainty analysis makes no inferences about input data (e.g., historical rainfall) uncertainty.
5. The average uncertainty band for the park is about 0.58 feet.
6. The half-width associated with the simulated canal levels has an average of 0.58 feet (versus 0.21 for parameter uncertainty). Again, this difference is probably due to data uncertainties associated with measured rainfall and estimated evapotranspiration.

Figs. 8.2.1 through 8.2.5 show the more traditional plots of uncertainty bands for selected gaging stations. Figs. 8.2.6 through 8.2.8 depict historical and simulated outflows to tide for the three LEC Service Areas. In general, the model simulates coastal outflows adequately. The width of the full uncertainty band shows that monthly uncertainties are acceptable although negative bias exists during high flows for all Service Areas.

**Table 8.2.7** Half-Width of the 90% Total Uncertainty Band for Lower East Coast Service Area 1

Gage	#PTS	RSQ	A	B	Band	MSE	Bias	Variance
PB732	144	0.57	2.38	0.55	0.84	0.52	-0.21	0.48
PB88	134	0.42	2.79	0.29	0.84	1.87	-0.69	1.40
PB99	144	0.47	3.56	0.57	0.95	0.52	0.13	0.50
PB809	144	0.26	8.51	0.16	0.72	1.99	0.16	1.96
PB445	144	0.05	13.89	0.20	0.54	0.20	0.00	0.20
PB1491	80	0.48	6.78	0.20	0.95	34.37	5.44	4.76
PB1660	14	0.66	9.08	0.36	0.42	0.37	0.18	0.34
PB1661	13	0.59	6.86	0.49	0.45	0.67	-0.73	0.14
PB1495	55	0.63	2.10	0.50	0.55	0.44	0.39	0.28
PB1494	45	0.09	12.47	0.12	0.50	0.60	0.28	0.53
PB900	144	0.22	8.56	0.42	0.49	0.14	0.06	0.13
PB683	140	0.50	6.94	0.53	0.92	0.57	0.13	0.55
PB1515	21	0.58	10.56	0.38	0.42	0.26	0.13	0.25
PB1639	17	0.77	1.67	0.63	0.49	0.20	0.22	0.15
WPBCFS	37	0.74	2.54	0.69	0.26	0.04	-0.08	0.03
PB561	140	0.65	-0.18	0.95	1.71	1.79	-0.86	1.06
PB109	144	0.32	12.81	0.30	0.71	0.72	0.25	0.66
PB831	144	0.54	3.93	0.84	1.31	1.22	0.76	0.64
PB565	144	0.41	1.78	0.36	1.09	1.44	-0.30	1.34
LOXR1	60	0.25	6.04	0.34	0.65	0.33	0.11	0.32
SCUMW	66	0.04	7.18	0.09	1.28	3.15	0.32	3.05
JUP.W	69	0.55	0.32	0.76	1.53	0.95	-0.19	0.92
WPBCA	107	0.61	-0.49	1.03	1.10	0.43	-0.02	0.43

Y = A + B \* X

X : Observed (feet -NGVD)

Y : Simulated (feet -NGVD)

#PTS : Number of month-end water level points available

RSQ : Coefficient of Determination

BAND : 90 percent certainty band (feet)

MSE : Mean Square Error,  $\sum[(Y-X)^2]/\#PTS$ 

Bias : E(Y) - X

Variance : variance of the estimator

**Table 8.2.8** Half-Width of the 90% Total Uncertainty Band for Lower East Coast Service Area 2

Gage	#PTS	RSQ	A	B	Band	MSE	Bias	Variance
F291	144	0.42	0.98	0.30	0.47	0.40	-0.16	0.37
G1222	138	0.52	0.74	0.75	0.95	0.40	-0.20	0.36
G617	144	0.23	2.35	0.33	0.56	0.32	-0.25	0.26
G561	144	0.47	0.94	0.41	0.51	0.27	-0.08	0.27
G820A	79	0.57	0.51	0.61	1.00	1.81	-1.13	0.54
G853	142	0.44	1.97	0.40	1.53	5.78	1.86	2.33
G1225	139	0.31	1.54	0.31	0.70	0.62	-0.21	0.57
G2032	144	0.42	2.77	0.41	0.50	0.25	0.18	0.22
G2033	141	0.19	2.68	0.53	1.04	0.64	-0.43	0.46
G2031	144	0.24	5.21	0.28	0.41	0.19	0.01	0.19
G616	118	0.58	6.11	0.27	0.59	1.30	-0.08	1.30
G2030	127	0.49	3.74	0.58	0.83	0.43	0.22	0.38
G1213	144	0.57	4.67	0.61	1.02	0.59	-0.12	0.58
G1260	144	0.72	-0.80	0.76	1.41	3.05	-1.47	0.88
G1472	144	0.45	0.97	0.29	0.45	0.47	-0.23	0.42
G1473	144	0.40	1.00	0.30	0.47	0.38	-0.10	0.37
G1636	144	0.64	0.32	0.77	0.49	0.24	-0.38	0.10
G2035	144	0.40	0.40	0.46	0.68	0.50	-0.43	0.32
G1226	144	0.37	0.45	0.42	0.70	0.60	-0.48	0.38
G1224	144	0.55	0.97	0.37	0.42	0.29	-0.07	0.29
G1223	144	0.61	1.20	0.42	0.37	0.26	-0.25	0.20
G1322	129	0.07	2.84	0.15	0.47	0.25	0.02	0.25
G2034	144	0.36	0.95	0.70	1.11	0.52	-0.16	0.49
G2376	79	0.41	3.84	0.42	0.53	0.31	0.28	0.23
2B-Y	61	0.48	3.59	0.09	0.38	13.59	-3.01	4.55
G1221	95	0.59	1.27	0.40	0.33	0.16	0.00	0.16
S329	143	0.36	1.30	0.55	1.26	1.30	0.71	0.80
G2395	78	0.02	0.69	-0.02	1.81	68.11	5.50	37.89
G1220	144	0.51	1.07	0.33	0.43	0.41	-0.23	0.36
G2275	94	0.45	2.14	0.39	1.07	1.27	-0.12	1.26
G2444	49	0.57	-1.68	0.89	1.21	4.20	-1.92	0.51
G2443	49	0.29	1.81	0.58	0.92	0.74	-0.62	0.35
G1262	126	0.07	1.06	-0.06	1.87	74.15	6.38	33.41
G1316	90	0.27	0.83	0.76	1.54	2.08	-1.10	0.86
G2147	142	0.59	1.11	0.59	1.08	0.78	0.26	0.72
G2148	96	0.78	2.84	0.42	0.92	14.96	3.56	2.28
G1215	144	0.72	-0.27	0.61	1.52	3.50	-1.35	1.69
G1315	144	0.75	1.36	0.79	1.02	1.04	-0.76	0.46

note: Column headings are the same as in Table 8.2.7.

**Table 8.2.9** Half-Width of the 90% Total Uncertainty Band for Lower East Coast Service Area 3

Gage	#PTS	RSQ	A	B	Band	MSE	Bias	Variance
G613	144	0.68	0.35	0.76	0.42	0.11	-0.18	0.08
G1183	144	0.59	0.18	1.01	0.66	0.20	0.19	0.16
G596	144	0.31	3.00	0.41	0.87	0.54	-0.04	0.53
F319	144	0.61	-0.46	1.16	0.71	0.19	-0.09	0.19
F179	144	0.52	0.50	0.71	0.70	0.23	-0.16	0.21
G852	144	0.28	1.13	0.30	0.54	0.45	-0.36	0.32
F358	144	0.77	-0.35	1.07	0.66	0.18	-0.16	0.16
S196A	144	0.78	0.94	0.75	0.50	0.13	0.10	0.12
G1363	144	0.69	2.10	0.53	0.50	0.40	0.39	0.24
G614	144	0.76	0.98	0.84	0.66	0.42	0.49	0.17
G757A	144	0.65	2.14	0.49	0.49	0.27	0.08	0.26
S182	144	0.65	-0.17	0.98	0.55	0.17	-0.24	0.11
G855	144	0.58	0.21	0.91	0.99	0.39	-0.17	0.36
G799	96	0.73	-1.22	1.09	0.57	1.03	-0.96	0.12
G1488	144	0.72	-0.79	1.11	0.99	0.38	-0.15	0.36
G976	144	0.57	1.79	0.52	0.98	0.77	-0.08	0.76
G3253	109	0.46	-0.64	0.34	1.70	4.96	-0.84	4.26
G975	144	0.77	0.50	1.02	0.90	0.67	0.61	0.29
G972	144	0.63	1.53	0.73	0.65	0.22	0.19	0.18
G973	144	0.65	0.70	0.78	0.51	0.12	0.11	0.11
G3259A	92	0.66	-1.90	0.84	1.37	5.29	-2.14	0.71
G3329	84	0.38	0.33	0.80	0.85	0.32	-0.24	0.26
G3327	80	0.70	0.40	0.72	0.37	0.10	-0.19	0.07
F45	144	0.42	1.06	0.31	0.46	0.57	-0.48	0.35
F239	144	0.19	2.24	0.14	0.60	2.85	1.25	1.29
G1637	141	0.51	1.97	0.54	0.53	0.19	0.11	0.18
G1251	144	0.81	-0.98	1.39	0.57	0.21	-0.24	0.16
G864	144	0.73	0.06	0.91	0.64	0.18	-0.17	0.15
G1486	144	0.77	-0.07	0.98	0.54	0.12	-0.13	0.10
G1362	144	0.62	0.73	0.88	0.88	0.35	0.25	0.28

note: Column headings are the same as in Table 8.2.7.

**Table 8.2.9 (cont.)** Half-Width of the 90% Total Uncertainty Band for Lower East Coast

### Service Area 3

Gage	#PTS	RSQ	A	B	Band	MSE	Bias	Variance
G860	144	0.81	-1.64	1.48	0.59	0.31	-0.36	0.18
G553	144	0.72	-1.38	1.23	0.88	0.66	-0.60	0.31
G580	144	0.73	-0.67	1.19	0.71	0.23	-0.19	0.19
G858	144	0.54	0.18	0.89	0.94	0.39	-0.26	0.32
G3073	144	0.03	0.58	0.18	1.29	2.24	-1.11	1.01
G3074	144	0.01	0.94	0.04	1.31	3.58	0.56	3.27
G551	68	0.55	0.59	0.58	0.82	0.39	-0.01	0.39
G1074B	87	0.16	0.98	0.10	1.18	20.67	3.47	8.62
G3439	45	0.64	1.24	0.70	0.64	0.19	0.09	0.19
G3328	81	0.73	-0.11	0.95	0.35	0.09	-0.23	0.04
G974	144	0.62	0.86	0.60	0.96	0.65	-0.29	0.57
G968	144	0.55	0.71	0.91	1.46	0.79	0.12	0.77
G3264A	79	0.69	-1.83	1.39	1.04	1.02	-0.76	0.45
G3	144	0.01	2.62	0.02	0.85	8.61	1.91	4.98
G1368A	143	0.01	2.52	0.00	0.58	38.47	-1.47	36.29
S68	143	0.03	2.50	0.02	0.58	10.09	2.03	5.96
G1166	144	0.52	0.63	0.67	0.34	0.06	-0.11	0.05
G970	144	0.50	0.31	0.83	0.57	0.15	-0.17	0.12
S18	144	0.21	1.00	0.43	0.63	0.25	-0.20	0.21
G1487	91	0.35	2.96	0.34	0.46	0.39	-0.41	0.22
G789	144	0.69	1.14	0.60	0.50	0.25	-0.26	0.18

note: Column headings are the same as in Table 8.2.7.

**Table 8.2.10** Half-Width of the 90% Total Uncertainty Band for Water Conservation Areas

Gage	#PTS	RSQ	A	B	Band	MSE	Bias	Variance
1-7	140	0.46	1.41	0.89	0.95	0.41	-0.28	0.33
1-8T	95	0.53	0.88	0.94	1.15	0.47	-0.04	0.47
1-8C	144	0.64	6.48	0.59	1.01	0.78	0.33	0.67
1-9	142	0.50	2.80	0.82	0.94	0.34	-0.07	0.33
2A-17	137	0.78	0.54	0.93	0.91	0.42	-0.35	0.30
2A-300	106	0.67	0.96	0.89	0.95	0.39	-0.26	0.33
2A-159	74	0.83	-1.88	1.17	0.49	0.14	0.21	0.09
2B-21	77	0.71	2.24	0.68	1.64	1.71	-0.49	1.47
3A-NW	135	0.75	0.54	0.95	0.82	0.24	0.01	0.24
3A-10	126	0.51	-0.58	1.05	1.09	0.43	-0.07	0.43
3A-NE	131	0.46	5.08	0.52	1.17	0.89	0.25	0.83
3A-2	141	0.72	3.37	0.71	0.67	0.34	0.32	0.24
3A-3	142	0.84	1.83	0.87	0.70	0.51	0.56	0.20
3A-9	108	0.79	-1.23	1.10	0.82	0.31	-0.24	0.25
3A-4	130	0.87	-0.06	1.00	0.55	0.11	-0.02	0.11
3A-28	111	0.87	-0.07	1.00	0.53	0.11	-0.06	0.10
C54	135	0.48	4.62	0.58	1.03	0.56	0.04	0.56
3A-11	118	0.68	-4.82	1.35	0.96	1.09	-0.84	0.38
3A-S	97	0.81	0.00	1.02	0.53	0.14	0.20	0.10
L28	84	0.61	-0.92	1.08	0.91	0.30	-0.09	0.29
3A-SW	102	0.80	-1.51	1.15	0.65	0.16	-0.03	0.16
3B-2	50	0.59	3.39	0.52	0.48	0.23	-0.24	0.18
3B-29	35	0.78	-1.84	1.18	0.98	0.64	-0.54	0.35
3B-SE	66	0.51	1.61	0.70	1.45	0.91	-0.19	0.88
C296	68	0.47	4.44	0.53	1.56	1.61	-0.41	1.44
C495	72	0.63	1.92	0.72	1.20	0.94	0.55	0.64
3A-12	133	0.77	1.01	0.90	0.78	0.23	-0.04	0.23

note: Column headings are the same as in Table 8.2.7.

**Table 8.2.11** Half-Width of the 90% Total Uncertainty Band for Everglades National Park

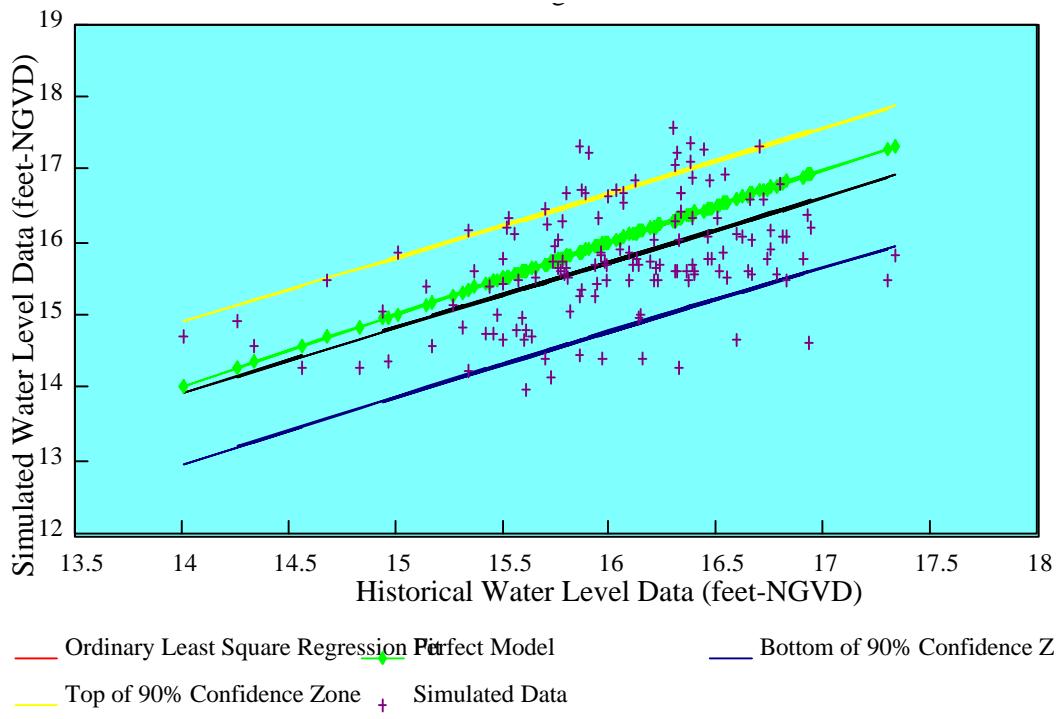
Gage #	PTS	RSQ	A	B	Band	MSE	Bias	Variance
NP201	88	0.89	1.35	0.78	0.28	0.10	-0.22	0.05
NESRS1	123	0.70	1.42	0.76	0.51	0.16	-0.21	0.12
NESRS2	123	0.71	0.04	0.99	0.70	0.18	0.00	0.18
NESRS3	76	0.68	0.44	0.86	0.92	0.44	-0.37	0.31
G618	144	0.70	0.52	0.92	0.70	0.18	0.02	0.18
G620	119	0.83	1.15	0.83	0.42	0.09	0.11	0.08
G1502	144	0.65	2.02	0.69	0.92	0.50	0.28	0.42
NP33	132	0.75	1.28	0.77	0.45	0.11	-0.12	0.09
NP206	90	0.66	2.61	0.57	0.92	0.90	0.51	0.64
NP36	140	0.61	1.01	0.72	0.57	0.16	-0.11	0.15
RUTZKE	78	0.71	1.65	0.70	0.53	0.34	0.45	0.15
THSO	59	0.92	0.31	0.81	0.35	0.12	-0.23	0.07
FROGP	77	0.54	-0.01	1.00	0.92	0.30	-0.01	0.30
NP207	35	0.63	-0.39	1.51	0.74	0.26	0.22	0.22
L67EXW	83	0.79	2.39	0.62	0.48	0.20	-0.12	0.19
L67EXE	88	0.75	0.95	0.85	0.51	0.10	-0.02	0.10
L67ES	84	0.69	1.80	0.69	0.53	0.17	-0.16	0.14
G3273	82	0.79	1.70	0.79	0.70	0.53	0.56	0.22
NP202	86	0.81	0.98	0.85	0.41	0.07	0.05	0.07
ANGEL	80	0.57	3.10	0.41	0.57	0.45	0.08	0.44
NP_PH	54	0.67	-0.23	1.17	0.48	0.08	-0.02	0.08
EVER1	60	0.82	-0.42	1.16	0.27	0.07	-0.21	0.03
EVER2B	58	0.72	-0.02	0.82	0.35	0.16	-0.34	0.05
EVER3	61	0.41	0.08	1.14	1.17	0.61	0.36	0.48
EVER4	62	0.74	0.06	1.00	0.49	0.09	0.07	0.08
G3353	61	0.71	-0.20	1.28	0.63	0.16	0.10	0.15
EPGW	58	0.65	-0.04	1.04	0.48	0.08	0.01	0.08
EP12R	25	0.61	-0.01	1.16	0.41	0.08	0.16	0.06
EP9R	19	0.79	0.45	1.15	0.41	0.36	0.55	0.05

note: Column headings are the same as in Table 8.2.7.

**Table 8.2.12** Half-Width Of the 90% Total Uncertainty Band for Canal Water Levels

Gage	#PTS	RSQ	A	B	Band	MSE	Bias	Variance
C-18	133	0.34	8.62	0.38	0.69	0.42	-0.09	0.42
C-51	144	0.18	9.63	-0.19	0.20	0.15	0.10	0.14
LWDSO	89	0.23	4.40	0.54	0.48	0.10	0.02	0.10
LWDSE	88	0.44	1.16	0.71	0.48	0.10	-0.11	0.09
L-8	144	0.10	7.28	0.41	2.96	3.88	-0.20	3.84
HLSB	132	0.43	7.87	-0.09	0.15	0.99	0.22	0.95
C-14	91	0.11	2.95	0.56	0.52	0.11	-0.06	0.10
C-14E	141	0.02	3.97	-0.05	0.59	0.99	0.27	0.91
C-13	135	0.03	3.22	0.18	0.67	0.49	-0.48	0.26
C-12	123	0.26	-0.86	1.12	0.90	0.51	-0.47	0.29
C-11W	144	0.07	2.69	0.17	0.49	0.22	0.00	0.22
C-11	132	0.11	1.68	-0.07	0.06	0.04	0.02	0.04
NNRC	141	0.11	3.85	-0.06	0.13	0.30	0.15	0.27
C-9	141	0.00	1.96	0.03	0.19	0.05	-0.12	0.04
C-6	65	0.34	0.97	0.61	0.36	0.05	0.02	0.05
C-2	136	0.52	0.59	0.75	0.43	0.09	-0.12	0.07
L-31NC	98	0.12	4.12	0.11	0.26	0.26	-0.12	0.25
L-31	144	0.48	2.54	0.37	0.44	0.25	0.02	0.25
C-111	114	0.55	0.98	0.68	0.50	0.12	-0.05	0.11
C-111E	144	0.51	0.90	0.52	0.34	0.09	-0.11	0.08
S197	133	0.29	0.63	0.47	0.50	0.22	-0.28	0.14
C-1P	131	0.35	1.55	0.59	0.93	0.39	-0.03	0.39
C102	144	0.69	0.56	0.82	0.58	0.14	-0.04	0.14
C103S	144	0.74	0.72	0.76	0.51	0.13	-0.09	0.12
S-179	144	0.87	-0.17	1.03	0.34	0.05	-0.09	0.04
L-30	86	0.67	-0.38	0.99	1.02	0.58	-0.45	0.37
L-29	120	0.76	0.56	0.83	0.88	1.64	-1.15	0.32
CA3	142	0.87	0.72	0.87	0.60	0.36	-0.46	0.15
C-7	136	0.05	2.06	-0.22	0.23	0.08	-0.17	0.05
C-8	141	0.01	1.33	0.19	0.44	0.14	-0.25	0.08
C-N0	65	0.40	-0.27	1.03	0.51	0.14	-0.22	0.09
S21	120	0.06	0.66	0.59	0.67	0.21	-0.21	0.16
C-102N	97	0.08	1.50	0.16	0.24	0.07	-0.01	0.07
CA-1	71	0.73	1.33	0.93	1.27	0.69	0.34	0.57

note: Column headings are the same as in Table 8.2.7.



Figure

Simulated Versus Historical Water Levels for Gage 1-7

e 8.2.1

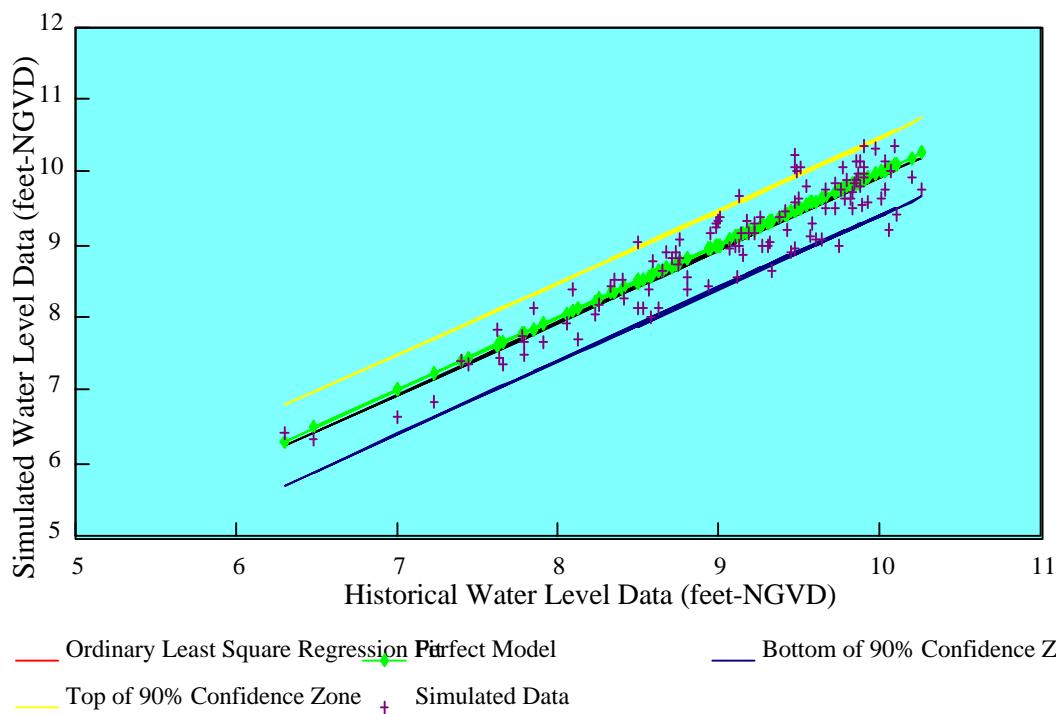
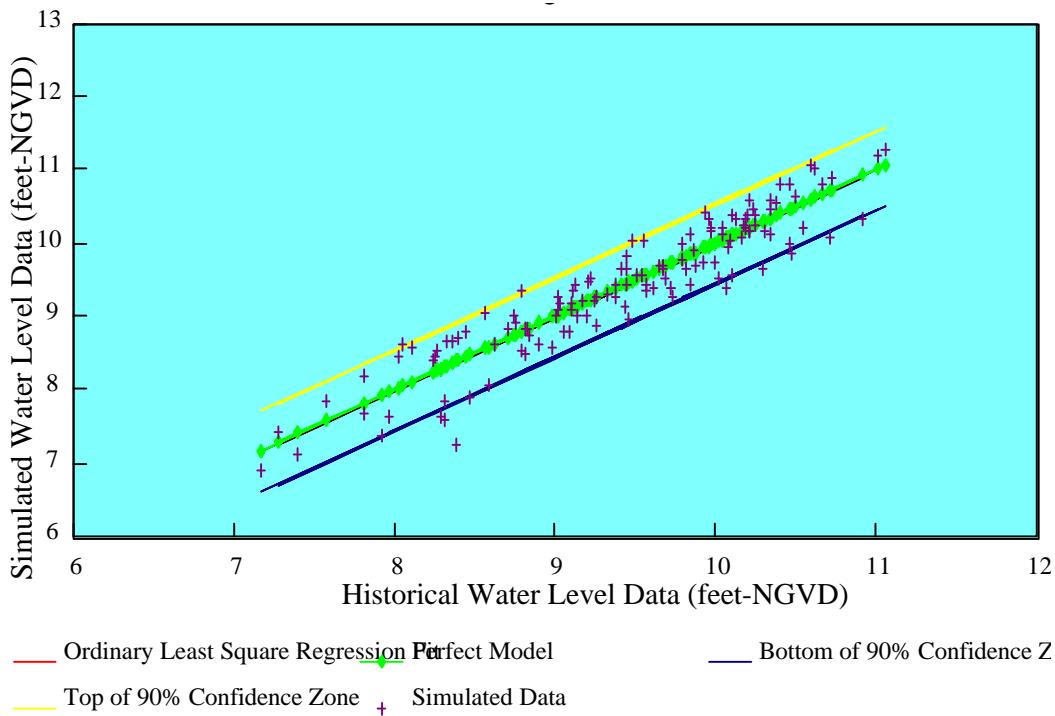
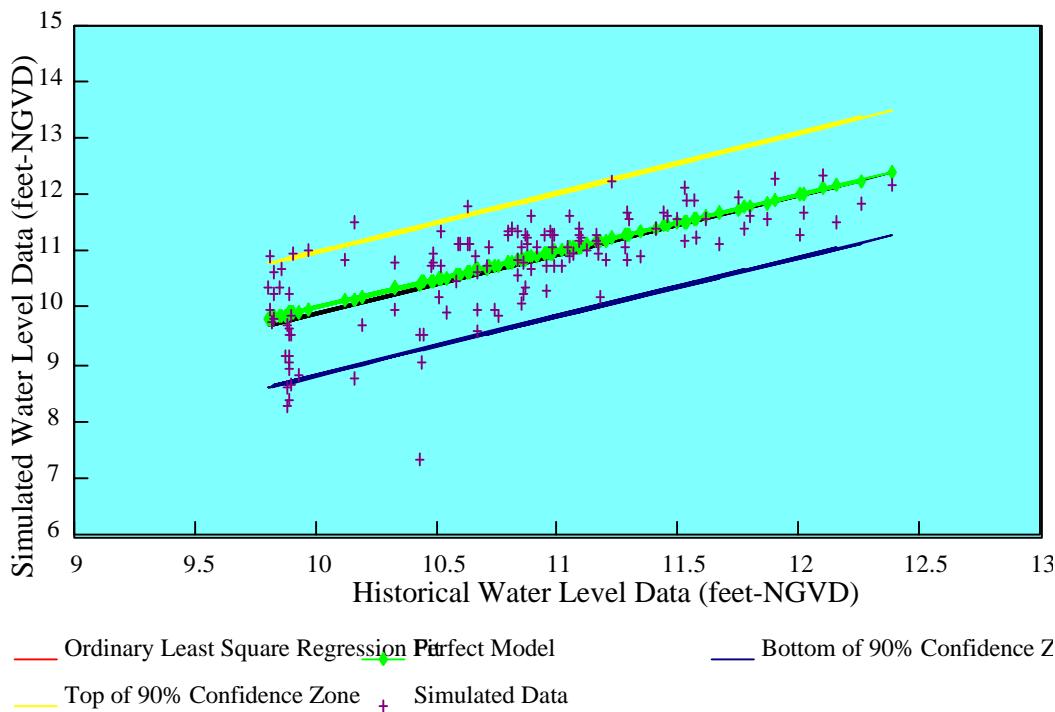


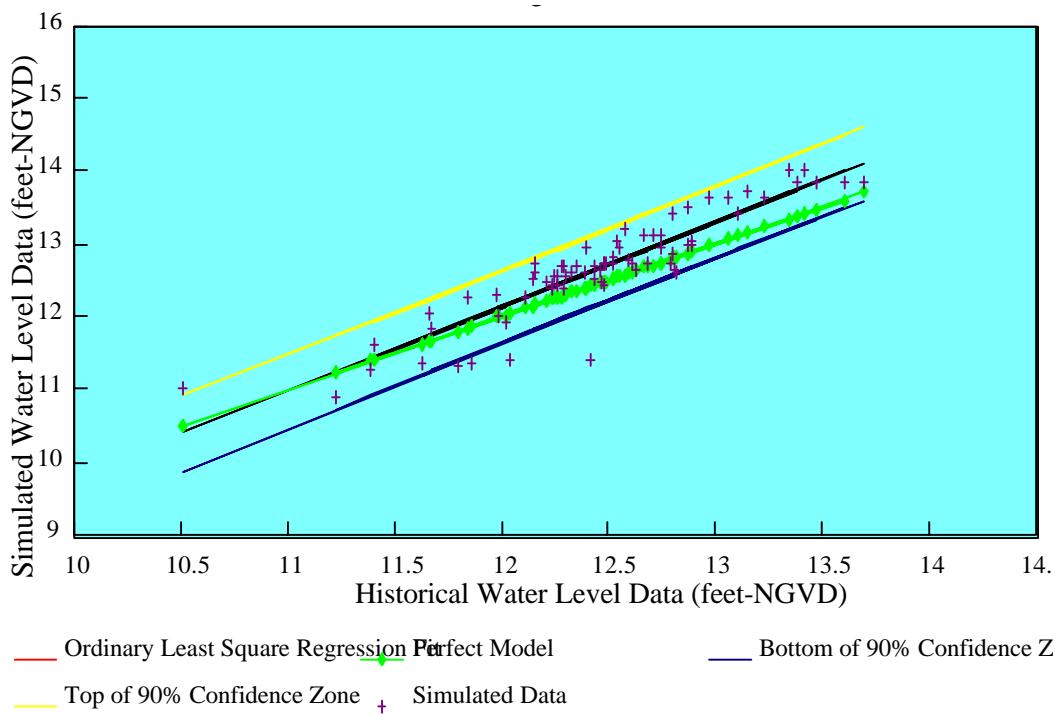
Figure 8.2.2 Simulated Versus Historical Water Levels for Gage 3A-28



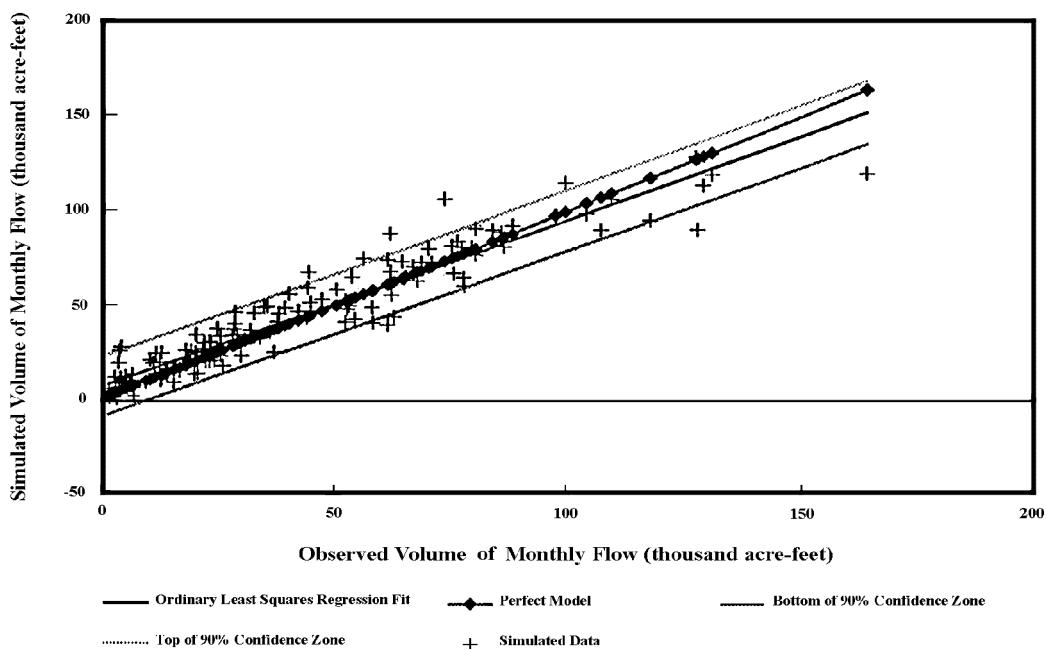
**Figure 8.2.3** Simulated Versus Historical Water Levels for Gage 3A-4



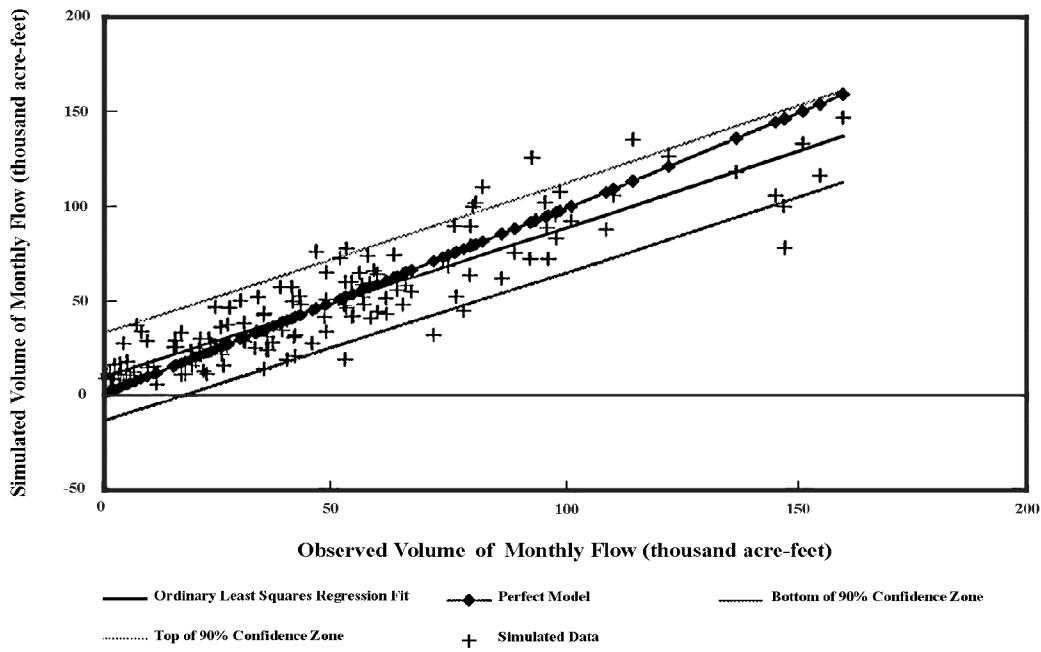
**Figure 8.2.4** Simulated Versus Historical Water Levels for Gage 3A-10



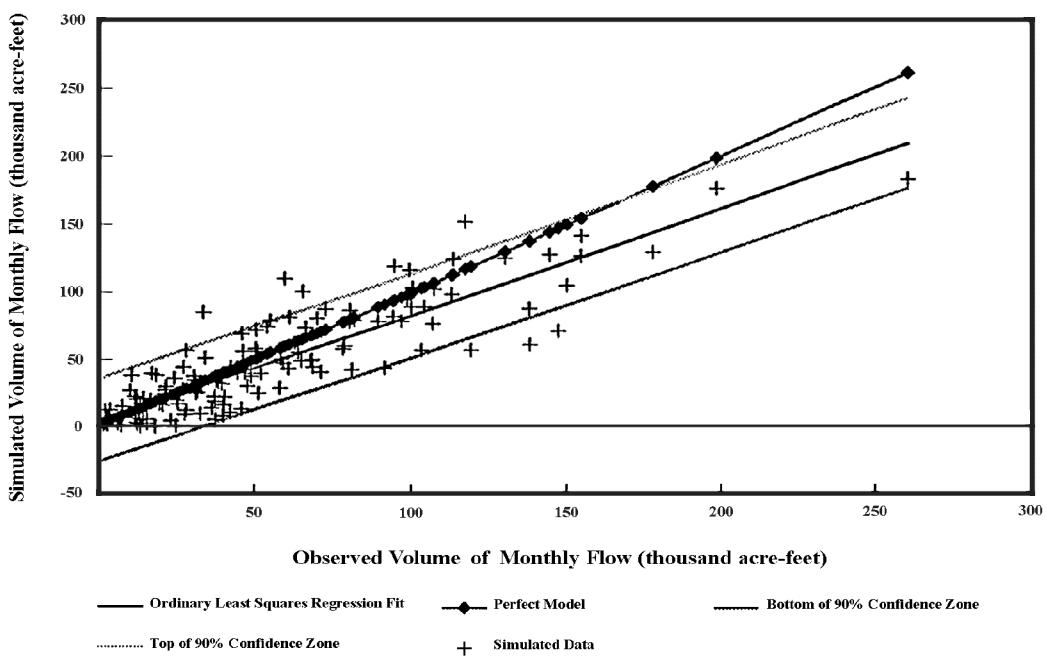
**Figure 8.2.5** Simulated Versus Historical Water Levels for Gage 2A-159



**Figure 8.2.6** Lower East Coast Service Area 1 (1979-1990) - Flows to Tide



**Figure 8.2.7** Lower East Coast Service Area 2 (1979-1990) - Flows to Tide



**Figure 8.2.8** Lower East Coast Service Area 3 (1979-1990) - Flows to Tide